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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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09/872,243

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Gary Ngai

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EXAMINER

THOMAS, SHANE M

ART UNIT

PAPER NUMBER

2186

DATE MAILED: 02/02/2004

8

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/872,243

Applicant(s)

NGAI ET AL.

Examiner

Shane M Thomas

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-53 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-4, 9-19, 21, 22, 25, 26, 28-31, 36-46, 48, 49, 52 and 53 is/are rejected.
- 7) ☒ Claim(s) 4-8, 20, 23, 24, 32-35, 47, 50 and 51 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 31 May 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. ____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
- a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 7.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 13 and 40 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

As per claims 13 and 40, it is unclear to what the terms --said step of automatically allocating-- and --the resource-- are describing in that the terms lack antecedent basis. For the purposes of examination the examiner will regard the --step of automatically allocating-- to be the step of --automatically adjusting-- of claim 1, and the term --the resource-- to be the entire storage space utilized by the segments.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-4, 9-19, 21, 22, 25, 26, 28-31, 36-46, 48, 49, 52, and 53 are rejected under 35 U.S.C. 102(e) as being anticipated by Beaven et al. (U.S. Patent No. 6,675,321).

As per claims 1 and 28, Beaven teaches a method for optimizing storage space for log records used to recover a processing apparatus from a transaction failure to a state before the transaction began (column 1, lines 14-21). The examiner will regard these maintained log files as --undo information-- since they allow the processing system's data, altered from a transaction, to be --undone-- if the transaction fails.

Regarding *undo information removing changes that are being made by a plurality of entities, wherein the undo information for each entity of the plurality of entities is stored in a segment of a plurality of segments with said storage space*, Beaven teaches in column 1, lines 14-36, that a log file is used to track a plurality of log records (--entities--) that make changes to a system during a transaction. These log records are stored in extent files (--segments--) within the storage space of log file 20 of figure 2. Figure 2 shows a plurality of extent files 21, 22, and 23 comprised on a log file 20. Each extent file is comprised of log

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records 21A, 21B, and 21C. These log files are stored on a storage space of a non-volatile storage device (column 1, lines 27-29).

Regarding *monitoring usage of the storage space by the entities*, Beaven teaches column 1, lines 38-62, that a maintenance operation known as --key-pointing-- is used to automatically adjust the parameters of the storage space and the log files in order to accommodate more space for ongoing transactions that outgrow the extent file.

Regarding *automatically adjusting at least one of the number of segments in the plurality of segments and the sizes of the plurality of segments based on usage*, Beaven states that another extent file (--segment--) can be allocated when the log records completely fill an extent file (column 1, lines 38-41). Further, the examiner is considering the size of the extent file to be the size of the extent file plus the --cushion-- data (column 1, lines 44-47). Thus, the *size* of the extent files can be reduced since when a key pointer function is performed, the extent file data is reduced to fit in the size of a normal extent file (column 2, lines 1-6).

Further regarding claim 28, Beaven anticipates a computer-readable medium carrying instructions for managing changes in a computer system in Beaven's claim number 8.

As per claims 2 and 29, as can be seen in figure 2, each log record (--entity--) is associated with an extent file (--segment--). Entities 21A, 21B, and 21C, are associated with extent file 21. The --undo information-- of the log records (--entities--) are stored in the segments based on usage; thus, if more log records are written, more extent files will be allocated.

As per claims 3 and 30, the examiner is defining a maximum amount of storage space as being the amount of storage space contained on the non-volatile storage devices. The object of

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the key-pointing operation is to free up all data of the log file that is not active data, thereby keeping the amount of data in the log reduced to a minimum (column 2, lines 1-9). The examiner is considering this process of managing the overall size of the transactions log file as *preventing a sum of the sizes of the plurality of segments from exceeding the maximum amount of storage space.*

As per claims 4 and 31, the examiner is regarding a *period of time* to be when a log record is written to an extent file. Thus every time a log record is written the system of figure 3 monitors to see whether the current extent file is full and if it is, to allocate an additional extent file for the next log record.

As per claims 9 and 36, the examiner is considering the --first conditions-- to be when the log records fill up an extent file. When this condition is met, a new extent file is allocated to store undo information (in log records) for new entities (log records such as 22N+1 and 22N+2, etc).

As per claims 10 and 37, the examiner is interpreting a *first amount of the storage space is not allocated to any segment of the plurality of segments* as being the --cushion-- file of column 1, lines 43-48. Thus, the --first conditions-- including making sure that a --cushion-- file has been allocated, which has been done prior to log records being written to the storage device (column 1, lines 44-48). This storage space is not allocated to any of the segments (extent files) in that it is pre-allocated (column 1, lines 43-48).

As per claims 11 and 38, figure 2 shows a plurality of entities (21A, 21B, and 21C) are stored in extent file 21.

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As per claims 12, and 39, when a current extent file can no longer accommodate more log records, processor 101 (figure 1) can allocate another extent file to store more log records (column 4, lines 18-28). Thus the examiner is interpreting this to mean the processor must determine for instance if extent file 22 (--first segment--) of figure 22 is currently not storing undo information (unallocated), and if not, allocating it to accommodate full extent file 21. The undo information of a new log record (entity) can then be stored in the new extent file.

As per claims 13 and 40, the examiner is considering a --first segment-- (22, figure 2) as comprising a --first amount-- (first part of the memory area between the vertical lines of 22 that is large enough to fit a log record) and not currently being used to store log records. If processor 101 determines that the presently allocated extent file (--segment-- 21 for example) is full, it will allocate another extent file (22 for example) and then associate the --first amount-- that is currently not used by the plurality of entities with a new entity (log record). Refer to column 4, lines 18-28.

As per claims 14 and 41, the examiner is considering the log record 21A as being a --first entity-- associated with extent file 21 (--first segment--) of the plurality of segments (22, 23, etc). Beaven states in column 1, lines 44-48, that the --cushion-- file can be allocated as a supplement to a --first segment-- when the segment is full and there is a shortage of disk space. Thus, the examiner is considering the --cushion-- file to be the --additional amount of storage space-- in the system that can be used to increase the --size-- of the --first segment-- when there is a shortage of disk space and the extent file is filled with log records.

As per claims 15 and 42, Beaven states in column 4, lines 24-32, that if sufficient storage is not allocated to an incoming log record (entity) the system will attempt to allocate another

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extent file (segment). If this is not possible, and disk space is running out, the system can increase the size of the --first segment-- by allowing the segment's data (log records) to be stored in the --cushion-- file as described in the rejection for claims 14 and 41 above and in column 1, lines 44-48.

As per claims 16 and 43, the examiner is considering the storage space used for the --cushion-- file to be sufficient space for storing the undo information from the log record until more space can be de-allocated from completed transactions (by running the key-handler operation (column 1, line 58 - column 2, line 9)).

As per claims 17 and 44, the size of the --cushion file-- (*additional amount*) is based on size of the storage space already allocated to a --first segment--. The size of the --first segment-- is set by an operator (column 1, line 38) and the --cushion-- file is pre-allocated as a spare extent file (segment). Thus the size of the --additional amount-- is *based* on the size of the --first segment--.

As per claims 18 and 45, the operator can configure the extent file to any size, thus the examiner is considering the --additional amount-- (--cushion-- file) to be selected from a plurality of --predetermined amounts-- since the size is --predetermined-- by the operator.

As per claims 19 and 46, the examiner is considering the *additional amount* (--cushion-- file) to not be allocated to another segment at the time when it is needed to be allocated since it is only allocated when disk space is low. Thus, as been stated above, if additional space is needed to accommodate log records when disk space is limited and an extent file is running out of allocated space, the --cushion-- file is allocated to that extent file.

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As per claims 21 and 48, the *amount of undo information that is monitored for each period of time* is a single log record.

As per claims 22 and 49, the examiner is considering the *monitoring of a number of entities started in each period of time* to be the monitoring of a single log record. Thus the monitoring checks to see if that single log record that started was the last one to be stored on an extent file (and then running the key-pointer operation) as mentioned in column 5, lines 23-33.

As per claims 25 and 52, Beaven states in column 1, lines 44-48, that the --cushion-- file (---additional amount---) is an extent of the contiguous storage space since it is a pre-allocated part of the contiguous storage space of the non-volatile storage device.

As per claims 26 and 53, the *allocation of unused amounts of the storage space (---cushion-- file) to the plurality of segments in response to receiving undo information* (data in the log records) *from the plurality of entities* (log records) occurs when the log file (20 figure 2) runs short of disk storage (column 1, lines 44-48) and more space is needed to be allocated for more log records when the last extent file is full.

Regarding *de-allocating unused amounts of the storage space from the plurality of segments periodically*, the examiner is considering the de-allocating to be of storage space to occur when the key-pointer operation has completed and storage space allocated to now completed transactions have been de-allocated (refer to column 1, lines 49-58)..

Allowable Subject Matter

Claims 5-8,20,23,24,32-35,47,50, and 51 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim 27 is allowed.

The following is a statement of reasons for the indication of allowable subject matter.

As per claims 5-7, 27, and 32-34, Beaven does not teach monitoring whether usage of the extent files has decreased over a predetermined and if so, shrinking an extent file or de-allocating a first amount from the extent file.

As per claims 8 and 35, Beaven does not teach comparing the de-allocated first amount to a predetermined minimum amount and then deleting the first segment (extent file) if the de-allocating the condition is true.

As per claims 20 and 47, Beaven does not teach a set of one or more entities alone associated with a second segment and further, de-allocating from the second segment (extent file) an unused portion of the storage space of the second segment and using it to allocate an additional amount for another segment.

As per claims 23 and 50, Beaven suggests that transactions executing on both the servers 12 and 13 of figure 1 can be executing (and thus storing log records concurrently), but Beaven does not teach monitoring a *maximum* number of multiple entities (log records) concurrently executing at the same time.

As per claims 24 and 51, Beaven does not suggest or teach monitoring a maximum duration in each period of time of queries terminating during that time.

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Conclusion

Prior art made of record and not relied upon and considered pertinent to applicant's disclosure are listed in PTO-892.

Menon et al (U.S. Patent No. 5,933,840) teaches using the age of a segment as a determining factor for garbage collection of a log structured storage.

Christennson et al. (U.S. Patent No. 6,324,620) teaches dynamic partitioning of a storage device based on frequency utilization.

Bachmat (U.S. Patent Application Publication No. 2003/0065883) teaches using statistical analysis of storage devices in order to balance disk activity.

Stoddard et al. (U.S. Patent No. 6,453,383) teaches the modification of data volume segments based on usage and requirements of the segments. Refer to figs 7-14.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shane M Thomas whose telephone number is (703) 605-0725.

The examiner can normally be reached on M-F 8:30 - 5:30.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matt M Kim can be reached on (703) 305-3821. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 764-7239 for regular communications and (703) 764-7239 for After Final communications.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-3900.



Shane M. Thomas
January 26, 2004



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